Issues in Cue Phrase Implicature

Issues in cue phrase implicature

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Abstract

Knott's empirical study of cue phrases has resulted in a taxonomic classification of some 150 cue phrases. The taxonomy can be viewed as a partial ordering on the set of phrases, and hence we can view cue phrase selection in terms of scalar implicature, following Hirschberg. We draw out some of the immediate consequences of this view, including the problematic status of the conventional/conversational distinction, and the proper treatment of high-level cue phrases. We conclude by considering how to test empirically some of the new predictions.

Introduction

The call for papers raised a number of questions, two of which we are directly addressing in new work:

Coherence How does conversational implicature relate to other discourse phenomena, e.g., coherence and discourse expectations?

Data Are there classes of discourse phenomena (e.g., ellipsis) which it would be advantageous to analyse as types of conversational implicature although they are not currently recognised as such in the computational literature?

Regarding the **Coherence** question, there is certainly general agreement that discourse context affects conversational implicature (cf. Grice [1975], Thomason [1977]). But in past work, we have investigated the complementary mechanisms whereby implicature can be used to help build up coherent hierarchical discourse structure (cf. Lascarides and Oberlander [1992, 1993]). So, our approach to the Coherence question has involved the study of the role of implicature in the communication of relational propositions.

Here, we maintain our course—studying implicature beyond the sentence—but on a slightly different tack. In addressing the **Data** question, we currently believe that *discourse cue phrases*—such as *so*, *as soon as*, and *as a result*—are a class of discourse phenomena which can be re-characterised in terms of conversational implicature—in particular, in terms of scalar quantity implicature (cf. Hirschberg [1991]). In previous work, we have argued that cue phrases have an intimate connection to discourse coherence relations (cf. Knott [1996]); thinking of cue phrases in terms of scalar implicature raises interesting new issues concerning criteria for cue phrase selection, and introduces new implementational possibilities.

It is worth observing that there are two important strands of existing work that touch on discourse cue phrases. First, there is Grice's own original work on implicature, in which he argues that connectives such as *but* and *therefore* trigger not *conversational*, but *conventional* implicatures. The contrastive sense of *but*, for instance, is not part of its semantics, but is an implicature; nonetheless, it is purely conventional—not calculable from the conversational maxims, not defeasible, and not detachable. Secondly, there is work on the connectives *or* and *and*, which has already attempted to cast them in terms of scalar quantity implicature (cf. Kempson [1975], Harnish [1979]). We hope that our approach, driven by Knott's taxonomy, provides a broad framework, permitting an analysis which challenges the

conversational/conventional split envisaged in the first strand, and allowing work from the second strand to be placed in a wider context.

The rest of this paper is structured as follows. Section 2 argues that's Knott's taxonomic classification of cue phrases can be used to generate partially-ordered sets, and that the phenomenon is therefore susceptible to an analysis in terms of scalar quantity implicature. Section 3 then indicates that the semantic basis for ordering the phrases provides a direct link to relational propositions. Section 4 discusses apparent problems for the account, arguing that they hinge on the purely sentential orientation of traditional tests for implicature, and that this limitation explains why cue phrases were not hitherto seen as cases of conversational—rather than conventional—implicature. Section 5 sketches ways in which the approach can address speakers' tendency to use apparently vague or uninformative general cue phrases. We then conclude by examining possible tests of Gricean hypotheses about cue phrase selection.

Cue phrases and scalar implicature

In this paper, we are interested in looking for implicatures drawn about the *structure* of a text, as opposed to about the meaning of its individual sentences and clauses. To obtain a window onto these structural implicatures, we are taking **sentence and clause connective phrases** as our object of investigation, and are examining the way they are interpreted. These phrases, together with certain other surface devices, form part of a class termed **cue phrases** by Knott [1996]; the term is used in a rather broader sense than normal, and is intended (roughly speaking) to cover all those phrases which have a semantic import beyond the clause in which they appear.[1]

It is uncontroversial that some phrases in this class provide more information than others. Consider for example the phrases *after* and *as soon as*. Both phrases provide information about a temporal succession between two events, but *as soon as* provides some information in addition; namely that the two events are causally linked. The extra information signalled by *as soon as* means that it can only be used in a subset of the contexts where *after* can be used. For instance, while both phrases can appear in Text 1, only the latter is appropriate in Text 2:

(1) The tension in the boardroom rose sharply $\left\{ \begin{array}{l} \textit{after} \\ \textit{as soon as} \end{array} \right\}$ the chairman arrived.

(2) The Normans invaded Britain $\left\{ \begin{array}{l} \textit{after} \\ *\ \textit{as soon as} \end{array} \right\}$ the Vikings did.

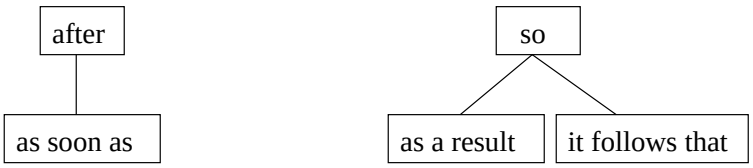
In other words, *after* is a **hypernym** of *as soon as*, and *as soon as* is a **hyponym** of *after*. A graphical representation of these relationships is given in Figure 1 (i). This representation is the foundation of Knott's taxonomy of cue phrases, in which many such relationships are systematically documented.

Figure 1 (ii) depicts a case where two phrases *as a result* and *it follows that* share a common hypernym *so*. This case is interesting as the additional information provided by one hyponym seems to conflict with that provided by the other. We can think of both phrases as signalling a cause of some kind, but while *as a result* is used to describe a causal relationship between events in the world, *it follows that* is used to signal the causal relationship between the belief in a premise and the belief in its conclusion. *So* can be used to signal both kinds of cause:

(3) The footprints are deep and well-defined. $\left\{ \begin{array}{l} \textit{It follows that} \\ \surd\ \textit{So} \\ *\ \textit{As a result,} \end{array} \right\}$ the thief was a heavy man.

(4) I had a puncture on the M25 on my way back from work. $\left\{ \begin{array}{l} \textit{As a result,} \\ \surd\ \textit{So} \\ *\ \textit{It follows that} \end{array} \right\}$ I missed most of the first half.

[1] See Knott [1996] for a more precise definition, which makes clear the commonalities between these apparently diverse linguistic devices.



(i) (ii)

Figure 1: Two Hyponym/Hypernym Relationships

The distinction between the relations signalled by *as a result* and *it follows that* maps onto one which has been widely discussed, between INFORMATIONAL and INTENTIONAL relations (Moore and Pollack [1992]), or between SEMANTIC and PRAGMATIC relations (Sanders *et al.* [1992]).

The hypernymic, hyponymic and alternativity relations among cue phrases can be described taxonomically, as in Knott [1996]. We can consider the taxonomic hierarchy to be a partially-ordered set of expressions, and hence, choice of cue phrase can be considered in terms of scalar quantity implicatures, after Hirschberg:

> Apparently, any poset can support scalar implicature, although other tests for conversational implicature may rule out some particular posets in particular exchanges. [Hirschberg 1991:128]

It seems from our initial investigations that the assimilation of cue phrases to scalar implicature does reveal commonalities. First, just as B's affirmation of the expression *33rd St.* expresses uncertainty as to whether the bus reaches Macy's, so too the use of the hypernymic *after* in place of *as soon as* carries the implicature that B cannot affirm the queried causal relationship:

(5) *A:* Does this bus go past Macy's?
B: It certainly goes to 33rd St.

(6) *A:* Did the Normans invade Britain *as soon as* the Vikings invaded?
B: They certainly invaded Britain *after* the Vikings invaded.

In a different world (signalled by the additional cues in B's response), B indicates that not only does the bus reach Macy's, but it reaches a more distant place in the spatial order. Similarly, B can use the hyponymic *as soon as* to indicate that a more specialised relation holds:

(7) *A:* Does this bus go past Macy's?
B: (Yes; in fact) it goes to 33rd St.

(8) *A:* Did the Normans invade Britain *after* the Vikings invaded?
B: (Yes; in fact) they invaded *as soon as* the Vikings did.

The provision of alternate values also works in a parallel way:

(9) *A:* Does this bus go past Macy's?
B: (No;) it goes to 33rd St.

(10) *A:* Did the Normans invade *before* the Vikings did?
B: (No;) they invaded *after* the Vikings did.

In each of these cases, B's response provides a new expression, and the salient scale can be consulted so as to determine whether the answer is compatible with the queried value, or is blocking it by implicature, as in Example 5. Of course, since implicatures are defeasible, we would expect to find cases where a implicature can be blocked by prior context. In the standard illustration, the cardinal implicature from *three* to *exactly three* goes through in Example 11, but not in Example 12:

(11) *A:* How many children does Bill have?
B: Bill has three children.

(12) *A:* Does Bill qualify for the large family scheme?
B: Sure—he has three children.

Indeed, we find that the same can apply for cue phrase implicature. Whereas *after* can usually have a causal interpretation read into it, this can be defeated by context:

(13) *A:* What happened at yesterday's board meeting?
B: The tension in the boardroom rose sharply *after* the chairman arrived.

(14) *A:* Did the tension in the boardroom rise before or after the chairman arrived?
B: The tension rose *after* the chairman arrived.

So, there are certainly indications that cue phrases can be considered in the light of scalar implicature. We now consider what they signal, before considering briefly some of the limits and strengths of the approach.

Cue phrases and relational propositions

> So, the partial orders which we may use to calculate scalar implicatures will consist of sets of expressions, *ordered via their correspondence to real-world entities and relationships*. [Hirschberg 1991:126; emphasis ours]

It seems plausible that cue phrases are members of posets; but where do the posets come from: what 'real-world' relationships generate their orderings? Now, Knott [1996] suggests that we can use the taxonomy to arrive at a set of features whose values will describe the space of possible cue phrases. It is then argued that, in any given case, we can think of a bundle of feature-values as corresponding to a discourse coherence relation. In this way, the cue phrase taxonomy generates a hierarchy of relational propositions, partially ordered by specificity.

For current purposes, this means that each underlying feature provides a means of ordering the set of cue phrases. The simplest cases involve cue phrases which differ only in that one specifies a value for a feature, whereas the other does not. For instance, the phrase *it follows that* specifies the values of two features, namely CAUSAL and PRAGMATIC; while its hypernym *so* only specifies the value of one feature, namely CAUSAL.

More generally, uses of cue phrases in question-answering contexts—as in the previous section—can be seen as confirming, denying or replacing a candidate relational proposition. A replacement might differ from the candidate in the values given for several features, but which features (or scales) are relevant is easy for an interpreter to determine. The question sets up certain scales as salient; the answer provides an expression which varies on some scale(s); implicatures are computed accordingly. In particular, given two feature-value bundles, the differences can be calculated, and the implicatures concerning relational propositions will be returned.

Cue phrase scales are actually rather simple. In the case of the bus going to Macy's in examples like 5, a one-dimensional spatial scale is established, providing a linear ordering on many locations. But a cue phrase scale partially orders the possible values for a given feature, and these are just $+$, $-$ and UNSPECIFIED. Hence, many different phrases will be grouped together on a given value of a given scale. Distinguishing two randomly chosen cue phrases will therefore involve comparison along several different scales, rather than just finding their respective positions on one comprehensive scale. In this respect, however, it does not differ from certain implicatures involving referring expressions:

(15) *A:* Was that a gazelle?
B: It was certainly brown.

Whereas mention of a gazelle might make salient a single scale ordering antelopes, mammals and animals, gazelles have many other features, and B can respond to A's utterance by affirming (or denying or declaring ignorance of) a value of any of those features, thereby implicating an answer to A's question. If this example is treated as parallel to Example 5, we can say that B has implicated a degree of uncertainty regarding the identity of the queried object.

For the moment, we can summarise the position by saying that cue phrase implicature is in general one form of **multiscalar** implicature.

Tests for conversational implicature: The case of *but*

We have suggested that cue phrases can be thought of as licensing and constraining implicatures about relational propositions in a discourse; we have also demonstrated that some of the relationships in the taxonomy of cue phrases can be explained in terms of scalar implicature. It might then be possible to use the taxonomy as the foundation for a systematic study of cue phrase implicature.

However, the use of questions to set up a context in which to examine implicature phenomena is only appropriate for a subset of cue phrases. Consider the following exchanges:

(16) *A:* ? Did John go out *but* Bill stay in?
B: * No, he went out *therefore* Bill stayed in.

(17) *A:* Did John go out and *as a result* get drunk?
B: * Well, he went and *so* got drunk.

As these examples show, it is not always possible to bring connectives 'into focus' in the way illustrated in Examples 6, 8 and 10. In fact, only sentence subordinators like *before* and *after* can be focused in this way. This might be taken as evidence against a systematic implicature-based account of cue phrases.

This suggestion seems to be in accordance with Grice's own views. In fact, Grice establishes a completely separate category of implicature, termed **conventional implicature**, for dealing with cue phrases.[2] Conventional implicatures differ from conversational implicatures in two main respects. Firstly they are **non-cancellable**, unlike conventional implicatures, which can be cancelled by contextual information. In Example 18, the implicature 'three houses *and no more*' is cancelled in the second sentence, but it not possible to cancel the contrast introduced by *but* in Example 19.

(18) Bob has three houses. In fact, he has more than that.

(19) Bill is tall, but Bob is small. In fact, there is no contrast between these two facts.

Secondly, conventional implicatures are **detachable**, as they depend on the particular linguistic items used. To take an example from Levinson [1983:128]:

> if you substitute *and* for *but* you lose the conventional implicature but retain the same truth conditions.

However, the detachability and the non-cancellability of cue phrases are both debatable. To begin with Levinson's point: whether you lose the implicature triggered by *but* when you substitute *and* depends entirely on how much information is inferable from the context. Consider the following example:

(20) John and Bill are very different. John is rich, $\left\{ \begin{array}{l} \textit{but} \\ \surd\ \textit{and} \end{array} \right\}$ Bill is poor.

The contrast here is easily inferable from context and world knowledge, and is preserved when *and* is substituted.

Furthermore, phrases like *but* do trigger a number of defeasible conversational implicatures. Consider the portion of taxonomy given in Figure 2, motivated by the examples below:

(21) Bill tried to open the door;
$\left\{ \begin{array}{l} \textit{but} \\ \surd\ \textit{unfortunately} \\ *\ \textit{despite this} \\ *\ \textit{whereas} \end{array} \right\}$ it was locked.

(22) Bob felt very sick that day;
$\left\{ \begin{array}{l} \textit{but} \\ \surd\ \textit{despite this} \\ *\ \textit{unfortunately,} \\ *\ \textit{whereas} \end{array} \right\}$ he gave an excellent performance.

[2] Grice gives just three examples of conventional implicature: *but*, *and* and *therefore* (Grice [1975]). Other commentators, in particular Levinson [1983], have added to this list of cue phrases.

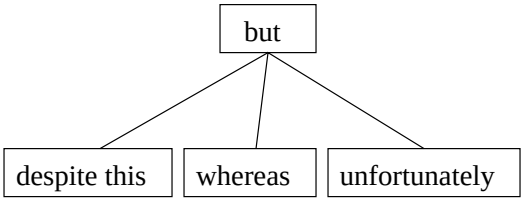


Figure 2: Some Hyponyms of *But*

(23) Bill is rich; $\left\{ \begin{array}{l} \textit{but} \\ \surd\ \textit{whereas} \\ *\ \textit{unfortunately,} \\ *\ \textit{despite this,} \end{array} \right\}$ Bob is poor.

The point is that *but* is an ambiguous cue phrase, which means quite different things in different contexts. It can be used to indicate an unsuccessful plan (as in Example 21), a violated expectation (as in Example 22), or a contrast (as in Example 23). The hyponymic phrases *unfortunately*, *despite this* and *whereas* serve to distinguish these possibilities explicitly for the reader. If *but* is used, the reader must infer the intended relational proposition from context and background knowledge. The maxim of quantity requires that the writer only use *but* in cases where the correct inference can be made, so that the reader relies on the assumption that this maxim is being adhered to when coming to an interpretation. The inferences made by the reader thus have all the characteristics of conversational implicatures; they are licensed or blocked by context, rather than by the literal meaning of the expressions which trigger them; and they are made on the assumption that the writer is being co-operative.

So how should we explain the strangeness of explicit cancellations such as those in Example 19? It it more plausible to attribute it to the difficulty of talking explicitly about relational propositions, rather than to difficulties in cancelling inferences triggered by *but*. It sounds almost as strange to mention the contrast in a case where no inconsistency results:

(24) John is rich; Bill is poor. ??There is a contrast between these propositions.

The stipulation that conversational implicatures can be cancelled *explicitly in follow-up sentences* excludes many discourse-level phenomena as a foregone conclusion, and obscures the interesting similarities noted above between inferences made about sentences and about relational propositions.

General Cue Phrases and Underspecified Relations

We have so far provided evidence that it is helpful to think of the interpretation of cue phrases in the light of Gricean maxims. However, are the implicatures triggered by a phrase like *but* really scalar in nature? The case for *after* and *as soon as* is quite straightforward: *after* can be used in the case where the writer is *unsure* whether or not a succession of events is immediate. In the right context, a reader would be able to implicate this uncertainty from the use of *after* (as in Example 6). But can *but* be used in a case where the writer is unsure whether two propositions stand in relationship of contrast or violated expectation? This seems harder to believe. How can a writer not be fully aware of the rhetorical structure of a text she herself has created?

One suggestion as to how we might think of writers 'underspecifying' relations is if a conversational maxim is **violated** in the presentation of a rhetorical relation. Grice talks about a maxim being violated when a speaker fails to adhere to it, and the failure is not obvious to the hearer. For instance, if Bill actually has four children, then B's answer in Example 25, although literally true, is a misrepresentation of the truth.

(25) *A:* How many children does Bill have?
B: Bill has three children.

The reader is not intended to realise that the standard implicatures are not to be drawn, and thus a maxim has been violated.

It does indeed seem that high-level cue phrases may be used to create deliberate and unnoticed ambiguity in this way. Consider the high-level phrase *so*, in an example based on Moore and Pollack's [1992]:

(26) Bush supports big business, *so* he'll veto House Bill 1711.

This example can be read in two ways; as a plain statement of fact about a cause that obtains in the world, or as an argument that Bush will veto House Bill 1711. It is only acceptable as a statement of fact if the writer actually *knows* that Bush will veto the bill. If the writer doesn't know this for sure, then it must be interpreted as an argument, with *Bush supports big business* as the premise, and *he will veto House Bill 1711* as the conclusion. The writer could signal this second interpretation explicitly, for instance by using the more specific cue phrase *it follows that*. But by retaining the ambiguity, it is possible for the writer to camouflage an argument as a statement of fact.

This is certainly an interesting application of the notion of conversational implicatures in the domain of cue phrases. However, it is not quite the kind of underspecification we require when we talk about cue phrases as triggering *scalar* implicatures. For high level cue phrases to fit into that picture—without maxim violation—we must consider the possibility that a writer could *prevent* implicatures from going through, by using such a phrase.

It should be possible to test (in an indirect way) whether this situation ever arises, and if so, how prevalent it is.

Testing alternative Gricean accounts of cue phrases

The fact is that general cue phrases like *but* and *so* do exist, and their existence demands an explanation. One hypothesis, then, is that they are used when a writer wishes to avoid affirming more specific relational propositions. The main alternative (the obvious move, given what we said earlier about *but* and *despite*) is that they are preferred when a writer can rely on context to license the implicature to the more specific relational proposition which the writer intends to pick out. This assumes that writers strive to avoid redundancy, observing the maxim of quantity once more.

These hypotheses—Underspecification versus Redundancy Avoidance—generate testable predictions, and we can sketch how to go about deciding between them. We know that the latter hypothesis has been tested in the domain of referring expressions (cf. Dale and Reiter [1995] for a review). Results such as those of Pechmann [1989] indicate that when called upon to pick out one object from a group of candidates, people produce descriptions which are less economical than might be expected. For example, if asked to identify a white bird from a set also including a black cup and a white cup, they will frequently use the modifier *white*, even though it is not strictly required.

If we think of the objects to be identified as the relational propositions in a text, a similar experiment can be envisaged to study choice of cue phrases. Consider the following texts:

(27) Bush supports big business; *it follows that* he'll veto House Bill 1711.

(28) Bush supports big business, *so* he's bound to veto House Bill 1711.

(29) Bush supports big business; *it follows that* he's bound to veto House Bill 1711.

In each of these texts, the relation to be identified is an argumentative one. In Example 27 this is signalled explicitly by the cue phrase *it follows that*, while in Example 28, it is signalled by the epistemic modal *bound to*. In Example 29, both of these signalling devices are used; in other words, more information has been provided than is necessary, in violation of the maxim of quantity. The question is: do we find such texts being produced by writers or speakers? This is a question we intend to address in future work.

If either set of predictions is borne out, we would have an interesting result, expanding Grice's theory to deal with a previously untreated phenomenon. But if the Redundancy Avoidance hypothesis is falsified, there are some particularly interesting consequences. We would have to take seriously the idea that a writer might leave aspects of their text structure radically underspec-

ified. One way of explaining this might be to recruit Reiter and Dale's 'non-Gricean' account of referring expressions, which proposes an algorithm that, amongst other things, prefers to use basic-level predicates (*dog*, rather than *animal* or *poodle*), unless there is specific reason not to (cf. Rosch [1978]). But to pursue such a line in this new domain, we would need to answer another new empirical question: is there a *basic level* for cue phrases?

Summary

This paper begins with the suggestion that the selection of cue phrases in a text can be explained in the light of Grice's notion of conversational implicature. The suggestion is a relatively new one: implicatures are typically thought of as being about the interpretation of individual sentences, but not about the relational propositions in a text.

Some of the standard tests for conversational implicature are set up specifically with sentence interpretation in mind, and are difficult to use to examine implicatures about discourse structure itself. Once this point is acknowledged, the accepted idea that cue phrases trigger conventional rather than conversational implicatures is open to question.

We finish by proposing a way of testing Gricean hypotheses about cue phrases, in a paradigm similar to that used in the experiments cited by Dale and Reiter. Consideration of alternative hypotheses that may be supported by the experiment throw up some interesting new suggestions about the processing of cue phrases.

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